

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**LISTING OF THE CLAIMS:**

1. (Currently Amended) An optical wavelength division multiplexing access system, whereby comprising a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said the OSU and said the W-MULDEM unit is established by extending a current-use optical fiber and a redundant optical fiber and access sections between said the W-MULDEM unit and said the individual ONUs are established by the extension of optical fibers, whereby wherein downstream optical signals from said the OSU to said the ONUs and upstream optical signals from said the ONUs to said the OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said the multiplexing section, and whereby wherein said the W-MULDEM unit performs wavelength multiplexing or wavelength demultiplexing for said the upstream or downstream optical signals to provide bidirectional transmission, characterized in that:

the OSU includes:

transmission means device for multiplexing downstream optical signals having wavelengths  $\lambda d1$  to  $\lambda dn$  that correspond to said the ONUs and that are to be transmitted to said the ONUs along said the current-use optical fiber, for multiplexing downstream optical signals having wavelengths  $\lambda d1+\Delta\lambda$  to  $\lambda dn+\Delta\lambda$  that correspond to said the ONUs and that are to be transmitted to said the ONUs along said the redundant optical fiber,

and for selecting either said the current-use optical fiber or said the redundant optical fiber ~~for use~~ for transmission, and

reception ~~means~~ device for receiving upstream optical signals having wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$  along said the current-use optical fiber or for receiving upstream optical signals having wavelengths  $\lambda_{u1}+\Delta\lambda$  to  $\lambda_{un}+\Delta\lambda$  along said the redundant optical fiber;

the individual ONUs receive corresponding downstream optical signals having wavelengths  $\lambda_{d1}$  to  $\lambda_{dn}$  or corresponding downstream optical signals having wavelengths  $\lambda_{d1}+\Delta\lambda$  to  $\lambda_{dn}+\Delta\lambda$ , which are received along said the optical fibers extended across said the access sections, the individual ONUs transmit, to said the optical fibers extended across said the access sections, corresponding upstream optical signals that have wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$  and ~~are to be~~ transmitted along said the current-use optical fiber extended across said the multiplexing section, or corresponding upstream optical signals that have wavelengths  $\lambda_{u1}+\Delta\lambda$  to  $\lambda_{un}+\Delta\lambda$  and ~~are to be~~ transmitted along said the redundant optical fiber;

the W-MULDEM unit includes an array waveguide diffraction grating (AWG) having two ports, ~~which are to be~~ respectively connected to said the current-use optical fiber and said the redundant optical fiber, and n ports, ~~which are to be~~ connected to optical fibers corresponding to said the ONUs;

the W-MULDEM unit demultiplexes to said the ports corresponding to said the ONUs said the downstream optical signals that have wavelengths  $\lambda_{d1}$  to  $\lambda_{dn}$  and are received along said the current-use optical fiber, or said the downstream optical signals that have wavelengths  $\lambda_{d1}+\Delta\lambda$  to  $\lambda_{dn}+\Delta\lambda$  and are received along said the redundant

optical fiber, or multiplexes, to said the port corresponding to said the current-use optical fiber or said the redundant optical fiber, said the upstream optical signals that have wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$  or wavelengths  $\lambda_{u1}+\Delta\lambda$  to  $\lambda_{un}+\Delta\lambda$  and that are received along said the optical fibers corresponding to said the ONUs; and

a wavelength difference between said the downstream optical signal and said the upstream optical signal corresponding to each of said the ONUs is integer times a free spectrum range (FSR) of said the AWG; and

the two ports of the AWG are provided at locations consonant with a wavelength difference ( $\Delta\lambda$ ) between optical signals transmitted along the current-use optical fiber and optical signals transmitted along the redundant optical fiber corresponding to each of the ONUs.

2. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 1, characterized in that said wherein the transmission means device includes:

switching means device for changing from a current-use optical fiber to a redundant optical fiber;

a supervisory light source for outputting current-use fiber supervisory light and reserve fiber supervisory light having wavelengths  $\lambda_{s0}$  and  $\lambda_{s1}$  that differ from the wavelengths of said the upstream optical signals and said the downstream optical signals;

a supervisory control unit, for detecting said the supervisory light having wavelengths  $\lambda_{s0}$  and  $\lambda_{s1}$  that is received along said the current-use optical fiber and said the redundant optical fiber, and outputting a selection signal to said the switching

means device to change from said the current-use optical fiber to said the redundant optical fiber;

a multiplexing unit, for multiplexing said the current-use fiber supervisory light having wavelength  $\lambda_{s0}$  and an optical signal transmitted along said the current-use optical fiber;

a demultiplexing unit, for demultiplexing said the current-use fiber supervisory light having wavelength  $\lambda_{s0}$  from an optical signal transmitted along said the current-use optical fiber;

a multiplexing unit, for multiplexing said the reserve fiber supervisory light having wavelength  $\lambda_{s1}$  and an optical signal transmitted along said the redundant optical fiber; and

a demultiplexing unit, for demultiplexing said the reserve fiber supervisory light having wavelength  $\lambda_{s1}$  from an optical signal transmitted along said the redundant optical fiber.

3. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 1, characterized by wherein:

when  $\lambda_{d1}$ ,  $\lambda_{d2}$ , . . . and  $\lambda_{dn}$  are defined as wavelengths of downstream optical signals that are transferred along said the current-optical fiber and correspond to said the ONUs, and when a wavelength interval is a constant, defining  $\lambda_{d1+k}$ ,  $\lambda_{d2+k}$ , . . . and  $\lambda_{dn+k}$  ( $1 \leq k < n$   $k$  is an integer of one or greater to smaller than  $n$ ) as wavelengths

of downstream optical signals that are transferred along said the redundant optical fiber to said the ONUs, and

when  $\lambda u_1, \lambda u_2, \dots$  and  $\lambda u_n$  are defined as wavelengths of upstream optical signals that are transferred along said the current-optical fiber and correspond to said the ONUs, and when a wavelength interval is a constant, defining  $\lambda u_{1+k}, \lambda u_{2+k}, \dots$  and  $\lambda u_{n+k}$  ( $k$  is an integer of one or greater) as wavelengths of upstream optical signals that are transferred along said the redundant optical fiber to said the ONUs.

4. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 3, characterized by wherein:

replacing  $\lambda d_n + i$  with  $\lambda d_i$  when  $\lambda d_n + i = \lambda d_i + \text{FSR}$  is established; and  
replacing  $\lambda u_n + i$  with  $\lambda u_i$  when  $\lambda u_n + i = \lambda u_i + \text{FSR}$  is established ( $i$  is an integer of 1 to  $k$ ).

5. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 1, characterized in that said wherein the OSU includes:

a switching means device for changing from said the upstream (or downstream) current-use optical fiber to said the upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for collectively detecting a transmission cutoff of upstream signals from said the ONUs, and for transmitting a selection signal to said the switching means device.

6. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 1, ~~characterized in that~~ wherein the OSU includes:

a switching means device for changing from said the upstream (or downstream) current-use optical fiber to said the upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for individually detecting a transmission cutoff of upstream signals from said the ONUs, and for transmitting a selection signal to said the switching means device.

7. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 1, ~~characterized in that~~ wherein the OSU includes:

means a unit for individually detecting a transmission cutoff of downstream signals.

8. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 2, ~~characterized in that~~ wherein, under a condition wherein that current-use optical receivers ~~and current-use optical receivers~~ are in the normal state, when said the current-use fiber supervisory light having wavelength  $\lambda s0$  is not detected and said the reserve fiber supervisory light having wavelength  $\lambda s1$  is detected, or when said the current-use fiber supervisory light having wavelength  $\lambda s0$  is

not detected and said the reserve fiber supervisory light having wavelength  $\lambda_{s1}$  is also not detected, and when said the upstream optical receivers of said the OSU do not receive upstream optical signals, said the supervisory control unit transmits a selection signal to perform communication using said the redundant optical fiber.

9. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 5, characterized in that wherein, when a transmission cutoff of all upstream optical signals is detected by said means the supervisory control unit that collectively detects a transmission cutoff of upstream optical signals from said the ONUs, said the supervisory control unit performs a process for transmitting a selection signal to perform communication using said the redundant optical fiber.

10. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 6, characterized in that wherein, when a transmission cutoff of all upstream optical signals is detected by said means the supervisory control unit that individually detects a transmission cutoff of upstream optical signals from said the ONUs, said the supervisory control unit performs a process for transmitting a selection signal to perform communication using said the redundant optical fiber.

11. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 1, characterized in that wherein, when a transmission cutoff of a plurality of upstream optical signals is detected by said means a supervisory control unit that individually detects a transmission cutoff of upstream optical signals

from said the ONUs, said the supervisory control unit performs a process for transmitting a selection signal to perform communication using said the redundant optical fiber.

12. (Currently Amended) An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged through a W-MULDEM unit, whereby a multiplexing section between said the OSU and said the W-MULDEM unit is established by extending a current-use downstream optical fiber, a current-use upstream optical fiber, a reserve downstream optical fiber and a reserve upstream optical fiber and access sections between said the W-MULDEM unit and said the individual ONUs are established by the extension of downstream optical fibers and of upstream optical fibers, whereby downstream optical signals from said the OSU to said the ONUs and upstream optical signals from said the ONUs to said the OSU are multiplexed, using wavelengths that are allocated to said the individual ONUs, and resultant optical signals are transmitted across said the multiplexing section, and whereby said the W-MULDEM unit performs either wavelength multiplexing or wavelength division for said the upstream or downstream optical signals to provide bidirectional transmission, characterized in that

wherein the OSU includes:

transmission ~~means~~ device for multiplexing downstream optical signals having wavelengths  $\lambda d1$  to  $\lambda dn$  that correspond to said the ONUs and that are to be transmitted to said the ONUs along said the current-use downstream optical fiber, for multiplexing downstream optical signals having wavelengths  $\lambda d1+\Delta\lambda d$  to  $\lambda dn+\Delta\lambda d$  that

correspond to said the ONUs and that are to be transmitted to said the ONUs along said the reserve downstream optical fiber, and for selecting either said the current-use downstream optical fiber or said the reserve downstream optical fiber used for transmission, and

~~reception means receivers~~ for receiving upstream optical signals having wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$  transmitted along said the current-use upstream optical fiber, or for receiving upstream optical signals having wavelengths  $\lambda_{u1}+\Delta\lambda_u$  to  $\lambda_{un}+\Delta\lambda_u$  transmitted along said the reserve upstream optical fiber;

the ONUs receive, along said the optical fibers extended across said the access sections, corresponding downstream optical signals having wavelengths  $\lambda_{d1}$  to  $\lambda_{dn}$  or corresponding downstream optical signals having wavelengths  $\lambda_{d1}+\Delta\lambda_d$  to  $\lambda_{dn}+\Delta\lambda_d$ , the ONUs transmit, to said the optical fibers extended across said the access sections, corresponding upstream optical signals that have wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$  and that are to be transmitted along said the current-use optical fiber extended across said the multiplexing section, or corresponding upstream optical signals that have wavelengths  $\lambda_{u1}+\Delta\lambda_u$  to  $\lambda_{un}+\Delta\lambda_u$  and are to be transmitted along said the redundant optical fiber;

the W-MULDEM unit includes:

a downstream array waveguide diffraction grating (downstream AWG) having two ports, which are to be respectively connected to said the current-use downstream optical fiber and said the reserve downstream optical fiber, and n ports, which are to be connected to optical fibers corresponding to said the ONUs, and

an upstream array waveguide diffraction grating (upstream AWG) having two ports, which are to be respectively connected to said the current-use upstream

optical fiber and said the reserve upstream optical fiber, and n ports, which are connected to said the optical fibers corresponding to said the ONUs; and

the W-MULDEM unit demultiplexes to said the ports of said the downstream AWG that correspond to said the ONUs said the downstream optical signals that have wavelengths  $\lambda_{d1}$  to  $\lambda_{dn}$  and are received along said the current-use downstream optical fiber, or said the downstream optical signals that have wavelengths  $\lambda_{d1}+\Delta\lambda_d$  to  $\lambda_{dn}+\Delta\lambda_d$  and are received along said the reserve downstream optical fiber, or multiplexes, to said the port corresponding to said the current-use upstream optical fiber or said the reserve upstream optical fiber, said the upstream optical signals that have wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$  or wavelengths  $\lambda_{u1}+\Delta\lambda_u$  to  $\lambda_{un}+\Delta\lambda_u$  and that are transmitted to said the upstream AWG along said the optical fibers corresponding to said the ONUs; and

the two ports of the downstream AWG are provided at locations consonant with a wavelength difference ( $\Delta\lambda_d$ ) between optical signals transmitted along the current-use downstream optical fiber and optical signals transmitted along the redundant downstream optical fiber corresponding to each of the ONUs and the two ports of the upstream AWG are provided at locations consonant with a wavelength difference ( $\Delta\lambda_u$ ) between optical signals transmitted along the current-use upstream optical fiber and optical signals transmitted along the redundant upstream optical fiber corresponding to each of the ONUs.

13. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, ~~characterized in that:~~ said wherein the transmission means device includes:

switching means device for changing from said the upstream (or downstream) current-use optical fiber to said the upstream (or downstream) redundant optical fiber,

a supervisory light source for outputting a current-use fiber supervisory light and a reserve fiber supervisory light having wavelengths  $\lambda_{s0}$  and  $\lambda_{s1}$  that differ from wavelengths of said the upstream optical signals and said the downstream optical signals,

a supervisory control unit, for detecting said the supervisory lights having wavelengths  $\lambda_{s0}$  and  $\lambda_{s1}$  that are received along said the upstream current-use fiber and said the upstream reserve fiber, and for outputting a selection signal to said the switching means device to change from said the upstream (or downstream) current-use fiber to said the upstream (or downstream) reserve fiber,

a multiplexing unit, for multiplexing said the current-use fiber supervisory light having wavelength  $\lambda_{s0}$  and an optical signal transmitted along said the downstream (or upstream) current-use optical fiber,

a demultiplexing unit, for demultiplexing said the current-use fiber supervisory light having wavelength  $\lambda_{s0}$  from an optical signal transmitted along said the upstream (or downstream) current-use optical fiber,

a multiplexing unit, for multiplexing said the reserve fiber supervisory light having wavelength  $\lambda_{s1}$  and an optical signal transmitted along said the downstream (or upstream) redundant optical fiber, and

a demultiplexing unit, for demultiplexing said the reserve fiber supervisory light having wavelength  $\lambda_{s1}$  from an optical signal transmitted along said the upstream (or downstream) redundant optical fiber; and

said the W-MULDEM unit includes:

a demultiplexing unit, for demultiplexing said the current-use optical fiber supervisory light having wavelength  $\lambda_{s0}$ , which has been multiplexed with said the optical signal and has been received along said the downstream (or upstream) current-use optical fiber,

a multiplexing unit, for re-multiplexing said the current-use optical fiber supervisory light having wavelength  $\lambda_{s0}$  and an optical signal transmitted along said the upstream (or downstream) current-use optical fiber,

a demultiplexing unit, for demultiplexing said the redundant optical fiber supervisory light having wavelength  $\lambda_{s1}$  that has been multiplexed with an optical signal and received along said the downstream (or upstream) redundant optical fiber, and

a multiplexing unit, for re-multiplexing said the redundant optical fiber supervisory light having wavelength  $\lambda_{s1}$  and an optical signal transmitted along said the upstream (or downstream) optical fiber.

14. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, characterized by: wherein,

when  $\lambda_{d1}$ ,  $\lambda_{d2}$ , . . . and  $\lambda_{dn}$  are defined as wavelengths of downstream optical signals that are transferred along said the current-optical fiber and correspond to said the ONUs, and when a wavelength interval is a constant, defining  $\lambda_{d1+k}$ ,  $\lambda_{d2+k}$ , . . . and  $\lambda_{dn+k}$  ( $1 \leq k < n$  ~~k is an integer of one or greater to smaller than n~~) as wavelengths of downstream optical signals that are transferred along said the redundant optical fiber to said the ONUs, and

when  $\lambda_{u1}$ ,  $\lambda_{u2}$ , . . . and  $\lambda_{un}$  are defined as wavelengths of upstream optical signals that are transferred along said the current-optical fiber and correspond to said the ONUs, and when a wavelength interval is a constant, defining  $\lambda_{u1+k}$ ,  $\lambda_{u2+k}$ , . . . and  $\lambda_{un+k}$  ( $k$  is an integer of one or greater) as wavelengths of upstream optical signals that are transferred along said the redundant optical fiber to said the ONUs.

15. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 14, characterized by: wherein, replacing  $\lambda_{dn} + i$  with  $\lambda_{di}$  when  $\lambda_{dn} + i = \lambda_{di} + \text{FSR}$  is established; and replacing  $\lambda_{un} + i$  with  $\lambda_{ui}$  when  $\lambda_{un} + i = \lambda_{ui} + \text{FSR}$  is established ( $i$  is an integer of 1 to  $k$ ).

16. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, characterized in that said OSU includes wherein the OSU comprises:

switching means device for changing from said the upstream (or downstream) current-use optical fiber to said the upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for collectively detecting a transmission cutoff of upstream signals from said the ONUs, and for transmitting a selection signal to said the switching means device.

17. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, characterized in that said OSU includes wherein the OSU comprises:

switching means device for changing from said the upstream (or downstream) current-use optical fiber to said the upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for individually detecting a transmission cutoff of upstream signals from said the ONUs, and for transmitting a selection signal to said the switching means device.

18. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, characterized in that said OSU includes wherein the OSU comprises:

means a unit for individually detecting a transmission cutoff of downstream signals.

19. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, ~~characterized in that~~ wherein, under a condition ~~wherein~~ that current-use optical receivers and current-use optical receivers are in the normal state, when said the current-use fiber supervisory light having wavelength  $\lambda s0$  is not detected and said the reserve fiber supervisory light having wavelength  $\lambda s1$  is detected, or when said the current-use fiber supervisory light having wavelength  $\lambda s0$  is not detected and said the reserve fiber supervisory light having wavelength  $\lambda s1$  is also not detected, and when said the upstream optical receivers of said the OSC do not receive upstream optical signals, said the supervisory control unit transmits a selection signal to perform communication using said the redundant optical fiber.

20. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 16, ~~characterized in that~~ wherein, when a transmission cutoff of all upstream optical signals is detected by said means the unit that collectively detects a transmission cutoff of upstream optical signals from said the ONUs, said the supervisory control unit performs a process for transmitting a selection signal to perform communication using said the redundant optical fiber.

21. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 17, ~~characterized in that~~ wherein, when a transmission cutoff of all upstream optical signals is detected by said the unit means that individually detects a transmission cutoff of upstream optical signals from said the

ONUs, said the supervisory control unit performs a process for transmitting a selection signal to perform communication using said the redundant optical fiber.

22. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 17, characterized in that wherein, when a transmission cutoff of a plurality of upstream optical signals is detected by said the means unit that individually detects a transmission cutoff of upstream optical signals from said the ONUs, said the supervisory control unit performs a process for transmitting a selection signal to perform communication using said the redundant optical fiber.

23. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, characterized in that wherein wavelengths of downstream current-use optical signals that correspond to said the ONUs are equalized with wavelengths of upstream current-use optical signals, and wavelengths of downstream reserve optical signals are equalized with wavelengths of upstream reserve optical signals.

24. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, characterized in that: said OSU includes wherein the OSU comprises:

means a device for oscillating optical carriers having wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$ , which are used for upstream signals, so as to permit said the ONUs to generate

upstream optical signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream current-use optical fiber, and

means a device for oscillating optical carriers having wavelengths  $\lambda u1+\Delta\lambda u$  to  $\lambda un+\Delta\lambda u$ , which are used for upstream signals, so as to permit said the ONUs to generate upstream optical signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream redundant optical fiber; said the ONUs include:

means a device for modulating corresponding optical carriers, used for upstream signals, from among those that are received while multiplexed with downstream optical signals, and transmitting thereby obtained signals as upstream optical signals having wavelengths  $\lambda u1$  to  $\lambda un$ , or wavelengths  $\lambda u1+\Delta\lambda u$  to  $\lambda un+\Delta\lambda u$ ; a wavelength difference between said the downstream optical signals and said the upstream optical signals corresponding to said the ONUs is defined as integer times a free spectrum range (FRS) of said the downstream AWG; and

said the downstream AWG provided for said the W-MULDEM unit is so constituted as to separate, at the same time, said the downstream optical signals and said the optical carriers, used for upstream signals, which correspond to said the ONUs.

25. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 12, characterized in that: said OSU includes wherein the OSU comprises:

means a device for oscillating optical carriers having wavelengths  $\lambda u1$  to  $\lambda un$ , which are used for upstream signals, so as to permit said the ONUs to generate

upstream optical signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream current-use optical fiber, and

means a device for oscillating optical carriers having wavelengths

$\lambda_{u1} + \Delta\lambda_u$  to  $\lambda_{un} + \Delta\lambda_u$ , which are used for upstream signals, so as to permit said the ONUs to generate upstream optical signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream redundant optical fiber;

said the W-MULDEM unit includes, in addition to said the downstream AWG and said the upstream AWG,

two wavelength group demultiplex filters, for demultiplexing downstream optical signals having wavelengths  $\lambda_{d1}$  to  $\lambda_{dn}$ , which are received along said the downstream current-use optical fiber from said the optical carriers having wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$  that are used for upstream signals, and for demultiplexing said the downstream optical signals having wavelengths  $\lambda_{d1} + \Delta\lambda_d$  to  $\lambda_{dn} + \Delta\lambda_d$ , which are received, along said the downstream redundant optical fiber, from said the optical carriers having wavelengths  $\lambda_{u1} + \Delta\lambda_u$  to  $\lambda_{un} + \Delta\lambda_u$  that are used for upstream signals,

an upstream signal optical carrier AWG, for routing said the optical carriers having wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$ , used for upstream signals, to ports corresponding to said the ONUs, and

n wavelength group coupling filters, for multiplexing said the downstream optical signals that are sorted by said the downstream AWG and said the optical carriers, used for upstream signals, that are sorted by said the upstream signal optical carrier AWG, and transmitting the resultant signals to said the downstream optical fibers that correspond to said the ONUs;

said the ONUs are so constituted as to modulate corresponding optical carriers, used for upstream signals, from among those that are received while multiplexed with the downstream optical signals, and to transmit the obtained signals as upstream optical signals having wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$ , or wavelengths  $\lambda_{u1}+\Delta\lambda_u$  to  $\lambda_{un}+\Delta\lambda_u$ .

26. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 25, characterized by: wherein,

when  $\lambda_{d1}$ ,  $\lambda_{d2}$ , . . . and  $\lambda_{dn}$  are defined as wavelengths of downstream optical signals that are transferred along the current-optical fiber and correspond to the ONUs, and when a wavelength interval is a constant, defining  $\lambda_{d1}+k$ ,  $\lambda_{d2}+k$ , . . . and  $\lambda_{dn}+k$  (1  $\leq$  k < n k is an integer of one or greater to smaller than n) as wavelengths of downstream optical signals that are transferred along the redundant optical fiber to the ONUs, and

when  $\lambda_{u1}$ ,  $\lambda_{u2}$ , . . . and  $\lambda_{un}$  are defined as wavelengths of upstream optical signals that are transferred along the current-optical fiber and correspond to the ONUs, and when a wavelength interval is a constant, defining  $\lambda_{u1}+k$ ,  $\lambda_{u2}+k$ , . . . and  $\lambda_{un}+k$  (k is an integer of one or greater) as wavelengths of upstream optical signals that are transferred along the redundant optical fiber to the ONUs.

27. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 26, characterized by: wherein,

replacing  $\lambda_{dn} + i$  with  $\lambda_{di}$  when  $\lambda_{dn} + i = \lambda_{di} + \text{FSR}$  is established; and  
replacing  $\lambda_{un} + i$  with  $\lambda_{ui}$  when  $\lambda_{un} + i = \lambda_{ui} + \text{FSR}$  is established (i is an integer  
of 1 to k).

28. (Currently Amended) The An optical wavelength division multiplexing  
access system according to claim 26, ~~characterized in that said means wherein the~~  
~~device for oscillating said the~~ optical carriers, having wavelengths  $\lambda_{u1}$  to  $\lambda_{un}$ , that are  
used for upstream signals, and ~~said means the device for oscillating said the~~ optical  
carriers, having wavelengths  $\lambda_{u1+k}$  to  $\lambda_{un+k}$ , that are used for upstream signals, are  
constituted by one ~~means device~~ for oscillating optical carriers having wavelengths  $\lambda_{u1}$   
to  $\lambda_{un+k}$ ; and ~~said the~~ optical carriers having wavelengths  $\lambda_{u1}$  to  $\lambda_{un+1}$ , used for  
upstream signals, are transmitted to ~~said the~~ downstream current-use optical fiber and  
~~said the~~ downstream redundant optical fiber.

29. (Currently Amended) The An optical wavelength division multiplexing  
access system according to claim 13, ~~characterized in that: said wherein the~~  
~~transmission means device includes:~~

n current-use optical transmitters and n reserve optical transmitters, for  
transmitting downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$  and  
downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ ,

a downstream current-use wavelength multiplexing unit, having n ports to  
be connected to ~~said the~~ n current-use optical transmitters and one port to be  
connected to ~~said the~~ downstream current-use optical fiber, and

a downstream reserve wavelength multiplexing unit, having n ports to be connected to said the n reserve optical transmitters and one port to be connected to said the downstream optical fiber;

said the downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , which are received from said the n current-use optical transmitters and are multiplexed by said the downstream current-use wavelength multiplexing unit, and a resultant signal is output to said the downstream current-use optical fiber;

said the downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which are received from said the n reserve optical transmitters, are multiplexed by said the downstream reserve wavelength multiplexing unit, and a resultant signal is output to said the downstream redundant optical fiber; and

said the current-use and reserve optical transmitters include means devices for selecting the presence/absence of an optical output in accordance with a selection signal received from said the supervisory control unit.

30. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, characterized in that: said wherein the transmission means device includes:

n current-use optical transmitters and n reserve optical transmitters, for transmitting downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$  and downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ ,

n downstream current-use optical switches, for setting ON or OFF for the output of received optical signals,

a downstream current-use multiplexing unit, having n ports to be connected to said the n downstream current-use optical switches and one port to be connected to said the downstream current-use optical fiber,

n downstream reserve optical switches, for setting ON or OFF for the input of received optical switches, and

a downstream reserve multiplexing unit, having n ports to be connected to said the n downstream reserve optical switches and one port to be connected to said the downstream redundant optical fiber;

said the downstream optical signals transmitted by said the current-use optical transmitters and said the reserve optical transmitters are received by said the optical switches, and outputs of said the optical switches are selected in accordance with a selection signal transmitted by said the supervisory control unit;

said the downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , output by said the n current-use optical switches, are multiplexed by said the downstream current-use multiplexing unit and a resultant signal is output to said the downstream current-use optical fiber;

said the downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , output by said the n reserve optical switches, are multiplexed by said the downstream reserve multiplexing unit and a resultant signal is output to said the downstream current-use optical fiber; and

when said the downstream current-use optical fiber is employed for transmission of downstream optical signals to said the ONUs, said the downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , corresponding to said the ONUs, are multiplexed,

and when said the downstream redundant optical fiber is employed for transmission, said the downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , corresponding to said the ONUs, are multiplexed, so that the transmission is performed by selecting either said the downstream current-use optical fiber, or said the downstream redundant optical fiber.

31. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, characterized in that: said wherein the transmission means device includes:

n current-use optical transmitters for, upon receiving downstream electric signals, transmitting downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , and n reserve optical transmitters, for, upon receiving downstream electric signals, transmitting downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ ,

a downstream current-use multiplexing unit, having n ports to be connected to said the n current-use optical transmitters and one port to be connected to a downstream current-use optical switch,

a downstream reserve multiplexing unit, having n ports to be connected to said the n reserve optical transmitters and one port to be connected to a downstream reserve optical switch,

one downstream current-use optical switch, for setting ON/OFF for the output of a multiplexed downstream optical signal received from said the downstream current-use multiplexing unit, and

one downstream current-use optical switch, for setting ON/OFF for the output of a multiplexed downstream optical signal received from said the downstream reserve multiplexing unit;

said the downstream current-use optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dwn}$ , output by said the n current-use optical transmitters, are multiplexed by said the downstream current-use multiplexing unit and a resultant signal is output to said the downstream current-use optical switch;

said the downstream reserve optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , output by said the n reserve optical transmitters, are multiplexed by said the downstream reserve multiplexing unit and a resultant signal is output to said the downstream reserve optical switch; and

either a current-use optical fiber or a redundant optical fiber to be used for output is selected in accordance with a selection signal transmitted by said the supervisory control unit.

32. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, characterized in that: wherein a wavelength  $\lambda_{dpk}$  ( $k = 1$  to  $n$ ) is set as  $\lambda_{dwk} + \Delta\lambda d$  ( $k = 1$  to  $n$ ;  $\Delta\lambda d$  is a constant value);

said the transmission means device includes:

n current-use optical transmitters and n reserve optical transmitters for, upon receiving downstream electric signals, outputting downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$  and downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ ,

n optical switches, used to select said the current-use optical transmitters that transmit a downstream optical signal having wavelength  $\lambda_{dwk}$  (k is an integer of one or greater to n or smaller), or said the reserve optical transmitters that transmit a downstream optical signal having wavelength  $\lambda_{dpk}$  (k is an integer of one or greater to n or smaller), and

    a downstream array waveguide diffraction grating (downstream AWG), having n ports to be connected to said the n optical switches and two ports to be connected to said the downstream current-use optical fiber and said the redundant optical fiber; and

said the downstream optical signals having wavelength  $\lambda_{dwk}$  and wavelength  $\lambda_{dpk}$  are transmitted from said the current-use optical transmitters to said the optical switches, either said the downstream optical signal having wavelength  $\lambda_{dwk}$  or wavelength  $\lambda_{dpk}$  is selected and output by said the n optical switches to said the downstream AWG, and in accordance with said the downstream optical signal having said the selected wavelength, said the downstream current-use optical fiber or said the downstream redundant optical fiber is employed to multiplex and output the resultant signal.

33. (Currently Amended) The An-optical wavelength division multiplexing access system according to claim 13, characterized in that: wherein a wavelength  $\lambda_{dpk}$  (k = 1 to n) is set as  $\lambda_{dwk} + \Delta\lambda$  (k = 1 to n;  $\Delta\lambda$  is a constant value);  
    said the transmission means device includes:

n current-use optical transmitters for selecting and transmitting downstream signals having either wavelength  $\lambda_{dwk}$  (k is an integer of one or greater to n or smaller) or wavelength  $\lambda_{dpk}$  (k is an integer of one or greater or n or smaller), and a downstream array waveguide diffraction grating (downstream AWG), having n ports to be connected to said the n optical transmitters and two ports to be connected to said the downstream current-use optical fiber and said the redundant optical fiber;

said the downstream optical signals having wavelength  $\lambda_{dwk}$  (k is an integer of one or greater to n or smaller) or wavelength  $\lambda_{dpk}$  (k is an integer of one or greater to n or smaller) are selected in accordance with a selection signal received from said the supervisory control unit and are output by said the optical transmitters; and said the downstream AWG multiplexes and outputs an obtained signal along said the downstream optical fiber or said the downstream redundant optical fiber that is consonant with said the downstream optical signals having said the selected wavelength.

34. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, ~~characterized in that: said wherein transmission means device includes:~~

n current-use optical receivers, for converting received upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  into upstream electric signals and outputting said the upstream electric signals, and n reserve optical receivers, for converting received

upstream optical signals having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  into upstream electric signals and for outputting said the upstream electric signals,

an upstream current-use demultiplexing unit, having n ports to be connected to said the n current-use optical receivers and one port to be connected to said the upstream current-use optical fiber, and

an upstream reserve demultiplexing unit, having n ports to be connected to said the n reserve optical receivers and one port to be connected to said the upstream reserve fiber;

said the upstream optical signals received along said the upstream current-use optical fiber are divided by said the upstream current-use demultiplexing unit and transmitted to said the current-use optical receivers;

said the upstream optical signals received along said the upstream redundant optical fiber are divided by said the upstream demultiplexing unit and transmitted to said the reserve optical receivers; and

upstream electric signals to be output are selected in accordance with a selection signal transmitted by said the supervisory control unit.

35. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, characterized in that: said wherein the transmission means device includes:

n current-use optical receivers, for converting received upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  into upstream electric signals and outputting said the upstream electric signals, and n reserve optical receivers, for converting

received upstream optical signals having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  into upstream electric signals and for outputting said the upstream electric signals,

an upstream current-use demultiplexing unit, having n ports to be connected to said the n current-use optical receivers and one port to be connected to said the upstream current-use optical fiber,

an upstream reserve demultiplexing unit, having n ports to be connected to said the n reserve optical receivers and one port to be connected to said the upstream reserve fiber,

one upstream current-use optical switch, used to set ON/OFF for the output, to said the upstream current-use demultiplexing unit, of upstream optical signals received from said the upstream current-use demultiplexing unit, and

one upstream reserve optical switch, used to set ON/OFF for the output, to said the upstream reserve demultiplexing unit, of upstream optical signals received from said the upstream reserve demultiplexing unit;

when said the upstream current-use optical switch and said the upstream reserve optical switch are set to ON or OFF in accordance with a selection signal received from said the supervisory control unit, either a multiplexed upstream optical signal, transmitted along said the upstream current-use optical fiber, or a multiplexed upstream signal, transmitted along said the upstream redundant optical fiber, is selected and is output to said the upstream current-use demultiplexing unit or said the upstream reserve demultiplexing unit, and signals obtained by said the demultiplexing unit are transmitted to said the current-use optical receivers or said the reserve optical receivers.

36. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, characterized in that: said wherein transmission means device includes:

n current-use optical receivers, for converting received upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  into upstream electric signals and outputting said the upstream electric signals, and n reserve optical receivers, for converting received upstream optical signals having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  into upstream electric signals and for outputting said the upstream electric signals,

an upstream current-use demultiplexing unit, having n ports to be connected to said the n current-use optical receivers and one port to be connected to said the upstream current-use optical fiber,

an upstream reserve demultiplexing unit, having n ports to be connected to said the n reserve optical receivers and one port to be connected to said the upstream reserve fiber,

n upstream current-use optical switches, used to set ON/OFF for the output, to said the upstream current-use demultiplexing unit, of upstream optical signals received from said the upstream current-use demultiplexing unit, and

n upstream current-use optical switches, used to set ON/OFF for the output, to said the upstream current-use demultiplexing unit, of upstream optical signals received from said the upstream current-use demultiplexing unit;

a multiplexed upstream optical signal transmitted to said the upstream current-use demultiplexing unit along said the upstream current-use fiber is demultiplexed and obtained signals are output to said the upstream current-use optical switches;

a multiplexed upstream optical signal transmitted to said the upstream reserve demultiplexing unit along said the upstream reserve fiber is demultiplexed and obtained signals are output to said the upstream reserve optical switches; and

when said the upstream current-use optical switches or said the upstream reserve optical switches are set to ON/OFF in accordance with a selection signal received from said the supervisory control unit, said the upstream current-use demultiplexing unit or said the upstream reserve demultiplexing unit is selected and signals are transmitted to said the current-use optical receivers or said the reserve optical receivers.

37. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 13, characterized in that: wherein a wavelength  $\lambda_{upk}$  ( $k = 1$  to  $n$ ) is set as  $\lambda_{uwk} + \Delta\lambda_u$  ( $k = 1$  to  $n$ ;  $\Delta\lambda_u$  is a constant value);

said the transmission means device includes:

optical transmitters for selecting and outputting upstream optical signals having either wavelength  $\lambda_{uwk}$  ( $k$  is an integer of one or greater to  $n$  or smaller) or wavelength  $\lambda_{upk}$  ( $k$  is an integer of one or greater or  $n$  or smaller),

$n$  optical receivers, for converting, into electric signals, received upstream optical signals having either wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$ , or wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , and outputting said the electric signals, and

an upstream array waveguide diffraction grating (upstream AWG), having two ports to be connected to said the upstream current-use optical fiber and said the redundant optical fiber and n ports to be connected to said the n optical receivers; said the upstream optical signal having wavelength  $\lambda_{uwk}$  (k is an integer of one or greater to n or smaller) or wavelength  $\lambda_{upk}$  (k is an integer of one or greater to n or smaller), which has been selected in accordance with a selection signal received from said the supervisory control unit, is transmitted to said the W-MULDEM unit; and said the W-MULDEM unit outputs said the upstream optical signal to said the current-use optical fiber or said the redundant optical fiber that is consonant with said the wavelength, and said the upstream AWG demultiplexes said the upstream optical signal and transmits the obtained signals to said the optical receivers.

38. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 37, characterized in that: said wherein the OSU includes:

means a device for oscillating optical carriers having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$ , which are used for upstream signals, so as to permit said the ONUs to generate upstream optical signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream current-use optical fiber, and

n optical transmitters, for selecting and outputting an upstream optical signal having wavelength  $\lambda_{uwk}$  (k is an integer of one or greater to n or smaller) or wavelength  $\lambda_{upk}$  (k is an integer of one or greater to n or smaller), and an upstream signal AWG, having two ports to be connected to said the current-use optical fiber and

said the redundant optical fiber and n ports to be connected to said the optical transmitters, both of said the optical transmitters and said the upstream signal AWG being provided as means, a device for oscillating optical carriers having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , that are used for upstream signals, so as to permit said the ONUs to generate upstream optical signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream redundant optical fiber;

    said the upstream optical signal, which has wavelength  $\lambda_{uwk}$  (k is an integer of one or greater to n or smaller) or wavelength  $\lambda_{upk}$  (k is an integer of one or greater to n or smaller), is output by said the upstream signal AWG to either said the current-use optical fiber or said the redundant optical fiber, which is consonant with a selection signal transmitted by said the supervisory control unit, and is multiplexed with a downstream optical signal and the resultant signal is transmitted to said the wavelength multiplexer.

39. (Currently Amended)    The An optical wavelength division multiplexing access system according to claim 38, characterized in that said wherein the optical transmitters add, to downstream signals, a selection signal transmitted by said the supervisory control unit and transmit the obtained signals to said the ONUs.

40. (Currently Amended)    An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said the OSU and said the W-MULDEM unit is established by extending a downstream current-use optical fiber, an upstream current-use optical fiber, a downstream redundant optical fiber and

an upstream redundant optical fiber, and access sections between said the W-MULDEM unit and said the individual ONUs are established by the extension of downstream optical fibers and upstream optical fibers, whereby downstream optical signals from said the OSU to said the ONUs and upstream optical signals from said the ONUs to said the OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said the multiplexing section, and whereby said the W-MULDEM unit performs wavelength multiplexing or wavelength division for said the upstream or downstream optical signals to provide bidirectional transmission, characterized in that:

the OSU includes:

transmission means device for multiplexing downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwN}$  that correspond to said the ONUs and that are to be transmitted to said the ONUs along said the downstream current-use optical fiber, for multiplexing downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpN}$  that correspond to said the ONUs and that are to be transmitted to said the ONUs along said the downstream redundant optical fiber, and for selecting either said the downstream current-use optical fiber or said the downstream redundant optical fiber for use for transmission, and

reception means device for receiving upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  along said the upstream current-use optical fiber or for receiving upstream optical signals having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  along said the upstream redundant optical fiber;

the individual ONUs receive corresponding downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$  or corresponding downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which are received along said the optical fibers extended across said the access sections, and transmit, to said the optical fibers extended across said the access sections, corresponding upstream optical signals that have wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  and are to be transmitted along said the upstream current-use optical fiber extended across said the multiplexing section, or corresponding upstream optical signals that have wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  and are to be transmitted along said the upstream redundant optical fiber;

said the W-MULDEM unit includes:

a downstream current-use demultiplexing unit corresponding to said the downstream current-use optical fiber, and a downstream reserve demultiplexing unit corresponding to said the downstream redundant optical fiber,

n wavelength group coupling filters for multiplexing, for corresponding ports, downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , which have been demultiplexed by said the current-use demultiplexing unit, and downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which have been demultiplexed by said the downstream reserve demultiplexing unit, and for outputting obtained signals to said the downstream optical fibers that correspond to said the ONUs,

an upstream current-use multiplexing unit corresponding to said the upstream current-use optical fiber and an upstream reserve multiplexing unit corresponding to said the upstream redundant optical fiber, and

n wavelength group demultiplex filters, for dividing and transmitting, to corresponding ports of said the upstream current-use multiplexing unit or said the upstream reserve multiplexing unit, said the upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  and having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , all of which are received from said the upstream optical fibers corresponding to said the ONUs;

wherein said the downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , which are received along said the downstream current-use optical fiber, or said the downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which are received along said the downstream redundant optical fiber, are divided into ports corresponding to said the ONUs;

said the upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$ , or said the upstream optical signals having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , which are received from said the upstream optical fibers corresponding to said the ONUs, are merged at said the port that corresponds to said the upstream current-use optical fiber or said the upstream redundant optical fiber; and

different bands are provided for said the wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$  of said the downstream current-use optical signals and said the wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  of said the downstream reserve optical signals, and different bands are provided for said the wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  of said the upstream current-use optical signals and said the wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  of said the upstream reserve optical signals.

41. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 40, characterized in that wherein wavelengths of downstream current-use optical signals that correspond to said the ONUs are equalized with wavelengths of upstream reserve optical signals, and wavelengths of upstream current-use optical signals are equalized with wavelengths of downstream reserve optical signals.

42. (Currently Amended) An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said the OSU and said the W-MULDEM unit is established by extending a downstream current-use optical fiber, an upstream current-use optical fiber, a downstream redundant optical fiber and an upstream redundant optical fiber, and access sections between said the W-MULDEM unit and said the individual ONUs are established by the extension of downstream optical fibers and upstream optical fibers, whereby downstream optical signals from said the OSU to said the ONUs and upstream optical signals from said the ONUs to said the OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said the multiplexing section, and whereby said the W-MULDEM unit performs wavelength multiplexing or wavelength division for said the upstream or downstream optical signals to provide bidirectional transmission, characterized in that: wherein the OSU includes:

transmission means device for, when said the ONUs are divided into two groups, #1 to #k and #k+1 to #n, and downstream optical signals are divided into two wavelength groups,  $\lambda_{d1}$  to  $\lambda_{dk}$  and  $\lambda_{dk+1}$  to  $\lambda_{dn}$ , multiplexing downstream optical signals having wavelengths  $\lambda_{d1}$  to  $\lambda_{dk}$  so as to transmit downstream optical signals to said the ONUs #1 to #k along said the downstream current-use optical fiber, for multiplexing downstream optical signals having wavelengths  $\lambda_{dk+1}$  to  $\lambda_{dn}$  for transmission along said the downstream redundant optical fiber to the ONUs #1 to #k, for multiplexing downstream optical signals having wavelengths  $\lambda_{dk+1}$  to  $\lambda_{dn}$  so as to transmit downstream optical signals to said the ONUs #k+1 to #n along said the downstream current-use optical fiber, and for multiplexing downstream optical signals having wavelengths  $\lambda_{d1}$  to  $\lambda_{dk}$  for transmission along said the downstream redundant optical fiber to the ONUs #k+1 to #n, so that either said the downstream current-use optical fiber or said the downstream redundant optical fiber is selected for transmission, and

reception means device for, when upstream optical signals are divided into two wavelength groups,  $\lambda_{u1}$  to  $\lambda_{uk}$  and  $\lambda_{uk+1}$  to  $\lambda_{un}$ , receiving upstream optical signals, for which wavelengths  $\lambda_{u1}$  to  $\lambda_{uk}$  for current use and wavelengths  $\lambda_{uk+1}$  to  $\lambda_{un}$  for reserve use are allocated for said the ONUs #1 to #k, and for which wavelengths  $\lambda_{uk+1}$  to  $\lambda_{un}$  for current use and wavelengths  $\lambda_{u1}$  to  $\lambda_{uk}$  for reserve use are allocated for said the ONUs #k+1 to #n;

said the ONUs receive, along said the downstream optical fibers at said the access sections, downstream optical signals having corresponding wavelengths  $\lambda_{d1}$  to  $\lambda_{dk}$ , or wavelengths  $\lambda_{dk+1}$  to  $\lambda_{dn}$ , and transmit, to said the upstream optical fibers,

upstream optical signals having corresponding wavelengths  $\lambda_{u1}$  to  $\lambda_{uk}$  when said the upstream current-use optical fiber at said the multiplexing section is employed for transmission, or transmit upstream optical signals having corresponding wavelengths  $\lambda_{uk+1}$  to  $\lambda_{un}$  when said the upstream redundant optical fiber is employed for transmission;

said the W-MULDEM unit includes:

two ports to be connected to said the downstream current-use optical fiber and said the downstream redundant optical fiber,

a downstream current-use demultiplexing unit corresponding to said the downstream current-use optical fiber and a downstream reserve demultiplexing unit corresponding to said the downstream redundant optical fiber,

n wavelength group coupling filters, for multiplexing, for said the individual ports, said the downstream optical signals having wavelengths  $\lambda_{d1}$  to  $\lambda_{dk}$  and  $\lambda_{dk+1}$  to  $\lambda_{dn}$ , which have been demultiplexed by said the downstream current-use demultiplexing unit, and said the downstream optical signals having wavelengths  $\lambda_{dk+1}$  to  $\lambda_{dn}$  and  $\lambda_{d1}$  to  $\lambda_{dk}$ , which have been demultiplexed by said the downstream reserve demultiplexing unit, and for transmitting obtained signals to said the upstream current-use optical fiber and said the upstream redundant optical fiber,

two ports to be connected to said the upstream current-use optical fiber and said the upstream redundant optical fiber,

an upstream current-use multiplexing unit corresponding to said the upstream current-use optical fiber and an upstream reserve multiplexing unit corresponding to said the upstream redundant optical fiber, and

n wavelength group demultiplex filters, for dividing said the upstream optical signals having wavelengths  $\lambda u_1$  to  $\lambda u_k$  and  $\lambda u_{k+1}$  to  $\lambda u_n$  and wavelengths  $\lambda u_{k+1}$  to  $\lambda u_n$  and  $\lambda u_1$  to  $\lambda u_k$ , which are received along said the upstream optical fiber corresponding to said the ONUs, and outputting the signals to said the corresponding ports of said the upstream current-use multiplexing unit or said the upstream reserve multiplexing unit; and

said the downstream optical signals having wavelengths  $\lambda d_1$  to  $\lambda d_n$ , which are received along said the downstream current-use optical fiber or said the downstream redundant optical fiber, are divided among said the ports corresponding to said the ONUs, and said the upstream optical signals having wavelengths  $\lambda u_1$  to  $\lambda u_n$ , which are received along said the upstream optical fibers corresponding to said the ONUs, are multiplexed at said the port that corresponds to said the upstream current-use optical fiber or said the redundant optical fiber.

43. (Currently Amended) An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said the OSU and said the W-MULDEM unit is established by extending a downstream current-use optical fiber, an upstream current-use optical fiber, a downstream redundant optical fiber and an upstream redundant optical fiber, and access sections between said the W-MULDEM unit and said the individual ONUs are established by the extension of downstream optical fibers and upstream optical fibers, whereby downstream optical signals from said the OSU to said the ONUs and upstream optical signals from said the

ONUs to said the OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said the multiplexing section, and whereby said the W-MULDEM unit performs wavelength multiplexing or wavelength division for said the upstream or downstream optical signals to provide bidirectional transmission, characterized in that: wherein

the OSU includes:

transmission means device for multiplexing downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwN}$  that correspond to said the ONUs and that are to be transmitted to said the ONUs along said the downstream current-use optical fiber, for multiplexing downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpN}$  that correspond to said the ONUs and that are to be transmitted to said the ONUs along said the downstream redundant optical fiber, and for selecting either said the downstream current-use optical fiber or said the downstream redundant optical fiber for use for transmission,

reception means device for receiving upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  along said the upstream current-use optical fiber or for receiving upstream optical signals having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  along said the upstream redundant optical fiber,

means a device for oscillating optical carriers, having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$ , which are used by said the ONUs for generation of upstream signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream current-use optical fiber, and

means a device for oscillating optical carriers, having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , which are used by said the ONUs for generation of upstream signals, and for multiplexing said the optical carriers and transmitting a resultant carrier to said the downstream redundant optical fiber;

the individual ONUs receive corresponding downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$  or corresponding downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which are received along said the optical fibers extended across said the access sections, and transmit, to said the optical fibers extended across said the access sections, corresponding upstream optical signals that have wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  and are to be transmitted along said the upstream current-use optical fiber extended across said the multiplexing section, or corresponding upstream optical signals that have wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$  and are to be transmitted along said the upstream redundant optical fiber;

said the W-MULDEM unit includes:

a downstream array waveguide diffraction grating (downstream AWG), having two ports to be connected to said the downstream current-use optical fiber and said the downstream redundant optical fiber and n ports to be connected to said the downstream optical fibers corresponding to said the ONUs,

an upstream array waveguide diffraction grating (upstream AWG), having two ports to be connected to said the upstream current-use optical fiber and said the upstream redundant optical fiber and n ports to be connected to said the upstream optical fibers corresponding to said the ONUs,

two wavelength group demultiplex filters, for demultiplexing optical carriers having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$ , which are used for upstream signals, from downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , which are received along said the downstream current-use optical fiber, and for demultiplexing optical carriers having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , which are used for upstream signals, from downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which are received along said the downstream redundant optical fiber,

an upstream signal optical carrier AWG, for dividing said the optical carriers, which have wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  and are used for upstream signals, among said the ports corresponding to said the ONUs, and

n wavelength group coupling filters, for multiplexing said the downstream optical signals, which have been demultiplexed by said the downstream AWG, and said the optical carriers, used for upstream signals, which have been demultiplexed by said the upstream signal optical carrier AWG, and for transmitting the resultant signals to said the downstream optical fibers corresponding to said the ONUs;

said the the downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , which are transmitted along said the downstream current-use optical fiber to said the downstream AWG, or said the downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which are transmitted along said the downstream redundant optical fiber, are divided among said the ports corresponding to said the ONUs; and

said the upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  or wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , which are transmitted to said the upstream AWG along said the upstream current-use optical fibers corresponding to said the ONUs, are merged at

said the port corresponding to said the upstream current-use optical fiber or said the upstream redundant optical fiber.

44. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 43, characterized by: wherein providing, instead of said the upstream signal optical carrier AWG, an upstream current-use signal optical carrier AWG corresponding to said the downstream current-use optical fiber and an upstream reserve signal optical carrier AWG corresponding to said the downstream redundant optical fiber, and n wavelength group coupling filters for multiplexing, for individual ports, said the upstream signal optical carriers having wavelengths  $\lambda_{uw1}$  to  $\lambda_{dwu}$ , which have been demultiplexed by said the upstream current-use signal optical carrier AWG, and said the upstream signal optical carriers having wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , which have been demultiplexed by said the upstream reserve signal optical carrier AWG;

providing, instead of said the downstream AWG, a downstream current-use AWG corresponding to said the downstream current-use optical fiber and a downstream reserve AWG corresponding to said the downstream redundant optical fiber, and n wavelength group coupling filters, for multiplexing, for individual ports, said the downstream optical signals having wavelengths  $\lambda_{dw1}$  to  $\lambda_{dwn}$ , which have been demultiplexed by said the downstream current-use AWG, and said the downstream optical signals having wavelengths  $\lambda_{dp1}$  to  $\lambda_{dpn}$ , which have been demultiplexed by said the downstream reserve AWG; and

providing, instead of said the upstream AWG, an upstream current-use AWG corresponding to said the upstream current-use optical fiber and an upstream reserve AWG corresponding to said the upstream redundant optical fiber, and n wavelength group demultiplex filters, for dividing said the upstream optical signals having wavelengths  $\lambda_{uw1}$  to  $\lambda_{uwn}$  and wavelengths  $\lambda_{up1}$  to  $\lambda_{upn}$ , which are received along said the upstream optical fibers corresponding to said the ONUs, and for transmitting resultant signals to corresponding ports of said the upstream current-use AWG or said the reserve AWG.

45. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 43, characterized by: wherein dividing said the ONUs are divided into two groups, #1 to #k and #k+1 to #n; and when dividing downstream optical signals into two wavelength groups,  $\lambda_{d1}$  to  $\lambda_{dk}$  and  $\lambda_{dk+1}$  to  $\lambda_{dn}$ , allocating current-use wavelengths  $\lambda_{d1}$  to  $\lambda_{dk}$  and reserve wavelengths  $\lambda_{dk+1}$  to  $\lambda_{dn}$  for said the ONUs #1 to #k, and allocating current-use wavelengths  $\lambda_{dk+1}$  to  $\lambda_{dn}$  and reserve wavelengths  $\lambda_{d1}$  to  $\lambda_{dk}$  for said the ONUs #k+1 to #n; when dividing upstream optical signals into two wavelength groups,  $\lambda_{u1}$  to  $\lambda_{uk}$  and  $\lambda_{uk+1}$  to  $\lambda_{un}$ , allocating current-use wavelengths  $\lambda_{u1}$  to  $\lambda_{uk}$  and reserve wavelengths  $\lambda_{uk+1}$  to  $\lambda_{un}$  for said the ONUs #1 to #k, and allocating current-use wavelengths  $\lambda_{uk+1}$  to  $\lambda_{un}$  and reserve wavelengths  $\lambda_{u1}$  to  $\lambda_{uk}$  for said the ONUs #k+1 to #n;

providing, instead of said the upstream signal optical carrier AWG, an upstream current-use signal optical carrier demultiplexing unit that corresponds to said the downstream current-use optical fiber and an upstream reserve signal optical carrier demultiplexing unit that corresponds to said the downstream redundant optical fiber, and n wavelength group coupling filters, for multiplexing, for individual ports, upstream signal optical carriers having wavelengths  $\lambda_{u1}$  to  $\lambda_{uk}$  and  $\lambda_{uk+1}$  to  $\lambda_{un}$ , which have been demultiplexed by said the upstream current-use signal optical carrier demultiplexing unit, and upstream signal optical carriers having wavelengths  $\lambda_{uk+1}$  to  $\lambda_{un}$  and  $\lambda_{u1}$  to  $\lambda_{uk}$ , which have been demultiplexed by said the upstream reserve signal optical carrier demultiplexing unit;

providing, instead of said the downstream AWG, a downstream current-use demultiplexing unit that corresponds to said the downstream current-use optical fiber and a downstream reserve demultiplexing unit that corresponds to said the downstream redundant optical fiber, and n wavelength group coupling filters for multiplexing, for individual ports, downstream optical signals having wavelengths  $\lambda_{d1}$  to  $\lambda_{dk}$  and  $\lambda_{dk+1}$  to  $\lambda_{dn}$ , which have been demultiplexed by said the downstream current-use demultiplexing unit, and downstream optical signals having wavelengths  $\lambda_{dk+1}$  to  $\lambda_{dn}$  and  $\lambda_{d1}$  to  $\lambda_{dk}$ , which have been demultiplexed by said the downstream reserve demultiplexing unit; and

providing, instead of said the upstream AWG, an upstream current-use multiplexing unit that corresponds to said the upstream current-use optical fiber and an upstream reserve multiplexing unit that corresponds to said the upstream redundant optical fiber, and n wavelength group demultiplex filters, for demultiplexing upstream

optical signals having wavelengths  $\lambda u_1$  to  $\lambda u_k$  and  $\lambda u_{k+1}$  to  $\lambda u_n$  and wavelengths  $\lambda u_{k+1}$  to  $\lambda u_n$  and  $\lambda u_1$  to  $\lambda u_k$ , which are received along said the upstream optical fibers corresponding to said the ONUs, and for transmitting resultant signals to corresponding ports of said the upstream current-use multiplexing unit or said the upstream reserve multiplexing unit.

46. (Currently Amended) The An optical wavelength division multiplexing access system according to claim 1, characterized by: allocating, for an arbitrary ONU, for two wavelengths or more for a downstream current-use optical signal, a downstream reserve optical signal, an upstream current-use optical signal and an upstream reserve optical signal, so as to obtain a dual structure for optical fibers at said the access sections.